Message

From: Phillips, Peter [PPhillips@GilbaneCo.com]
Sent: 7/27/2016 5:15:03 PM
To: Santiago-Ocasio, Carmen [Santiago-Ocasio.Carmen@epa.gov]; Gu, Ailiang [AGu@GilbaneCo.com]; Keller, Lynn [Keller.Lynn@epa.gov]
CC: Bill Schneider, Gilbane subcontractor [william.h.schneider@gmail.com]; Alex.Macdonald@waterboards.ca.gov
Subject: RE: Source terms and Dual porosity

Maybe, but it seems to me that it would only be for a limited portion of Zone 2. My very rudimentary understanding of the function of F&T models is that, if you put X lbs of contaminants into groundwater at point Y, you can estimate the concentrations of those contaminants at point Z based on your knowledge of existing subsurface conditions (geology, hydrogeology, hydrology and groundwater monitoring). I think Alex should be included in the trouble shooting as well.

Peter J. Phillips | Environmental Project Manager/Senior Geologist | Gilbane
2934 Gold Pan Court, Suite 12| Rancho Cordova, CA. | 95670
O: (916) 503-5475 | M: (916) 317-3244 | F: (916) 853-9824
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From: Santiago-Ocasio, Carmen [mailto:Santiago-Ocasio.Carmen@epa.gov]
Sent: Wednesday, July 27, 2016 10:01 AM
To: Gu, Ailiang; Phillips, Peter; Keller, Lynn
Cc: Bill Schneider, Gilbane subcontractor
Subject: RE: Source terms and Dual porosity

I guess I am lost again! But I want to follow up the same line of thought as Pete did. It goes to the heart of my issue with the OU5 RAO of mass reduction, and the lack of a performance standard. Can this F&T model can be used to predict or come up with a mass reduction performance standard? If so, since HOGOUT is in OU7 and it is the most highly contaminated area contributing to OU5 Zone 2, Can we use that as our "de-facto" value for all OU5 mass reduction performance standard?

Julie Santiago-Ocasio

Julie Santiago-Ocasio, RPM
US EPA Region 9 (SFD 7-1)
California Site Cleanup Section I
Superfund Division
75 Hawthorne Street
San Francisco, CA 94105
(415) 972-3525

From: Gu, Ailiang [mailto:AGu@GilbaneCo.com]
Sent: Wednesday, July 27, 2016 9:47 AM
To: Phillips, Peter <PPhillips@GilbaneCo.com>; Santiago-Ocasio, Carmen <Santiago-Ocasio.Carmen@epa.gov>; Keller, Lynn <Keller.Lynn@epa.gov>
Subject: RE: Source terms and Dual porosity

Hi Peter,

Source terms are difficult to pinpoint, so we have to look at the waste inventory at the facility to see if we can get some useful information. Also, during the model calibration process, we have to change the sources terms in order to match the concentration trending graphs for the downgradient monitoring wells. In addition, based on the depth to groundwater, we will also need to estimate when the contaminants likely first hit groundwater.

In comprehensive advanced modeling, a possibility distribution of sources terms will be used to bracket them. But I do not think it will go that route, it is mainly in the research state nowadays (stochastic modeling).

Ailiang

From: Phillips, Peter
Sent: Wednesday, July 27, 2016 9:32 AM
To: Gu, Ailiang; Santiago-Ocasio.carmen@Epa.gov; Keller.Lynn@epa.gov
Subject: RE: Source terms and Dual porosity

Thank you Ai,
If the exponential decay were used to estimate mass flux, is the rate of release from the source area estimated at a more realistic rate rather than the examples you provided (1000 lbs/yr for 5 years, 500 lbs/yr for 5 years)? I guess what I mean is does the use of exponential decay allow a model to more realistically represent the release into the environment at a facility like Aerojet in OU7? Not having read the RI, I can only rely on my memory for the types of activities that were conducted in the Island OU but I seem to think that the source area releases would have been much more episodic (releasing slugs of contaminants into groundwater rather than a constant rate of discharge). Wonder if that scenario fits the current depiction of the contaminant plumes in southwestern OU3. One thing for sure, it will be very interesting to see the plume configuration depictions once the Aerojet database and the IRCTS database have been merged and used to create the next round of plume maps.

Peter J. Phillips | Environmental Project Manager/Senior Geologist | Gilbane
2934 Gold Pan Court, Suite 12| Rancho Cordova, CA. | 95670
O: (916) 503-5475 | M: (916) 317-3244 | F: (916) 853-9824
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From: Gu, Ailiang
Sent: Tuesday, July 26, 2016 3:25 PM
To: Santiago-Ocasio.carmen@Epa.gov; Keller.Lynn@epa.gov
Cc: Phillips, Peter
Subject: Source terms and Dual porosity

Hi Julie and Lynn,

Just wanted to follow up with today's discussion regarding source terms and dual porosity, and explain a little bit more in this email to help you better understand these terms.

Source terms are needed in the flow and transport model to introduce the contaminant mass into groundwater which the model will simulate. Usually we do not have a clear picture about how much and how fast the contaminant mass (in most cases we do know the most likely locations [source areas] where the contaminant mass leached from the soil to groundwater) leached from the soil in the source area to groundwater. We will have to use the solvent inventory used at the site (if available) to estimate the likely total mass into groundwater, or based on the mass removal and estimated mass in groundwater to come up with an estimated total mass at the site. In the flow and transport model, ideally we can input the total mass in the model in the source area(s) to replicate the current plume shapes, and we have to assume (and adjust during modeling calibration process) how much mass in to groundwater in what time duration (stating year and end year) and some kind of function (for instance, first 5 years, it was 1000 pounds/year, and second 5 years it was 500 pound y/year; or using exponential decay function, etc.).

Dual porosity is used to better simulate the plume behavior (and more reflects the reality). The total porosity in the aquifer (for instance 0.30 is a very common number) can be divided into mobile and immobile porosity (the sum of these two equals to the total porosity). The contaminant mainly moves in the mobile porosity (or mobile domain), while the immobile porosity (immobile domain) acts as a storage of contaminant mass. Pump and treat system can treat the contaminant mass in the mobile porosity relatively quickly down to MCL, but once the system is shut down, the contaminant concentration rebounds due to the contaminant mass stored in the immobile porosity which gradually supplies mass to the mobile porosity. This also explain the long tail of contaminant concentration in many groundwater monitoring wells. The mass exchange between these two porosities are through diffusion process at a rate which we call "mass transfer coefficient".

I hope that it this explanation helps. If you have any questions, please let me know.

Thanks,
Ailiang

Ailiang Gu, PhD, PG. | Senior Hydrogeologist | Gilbane
2355 E. Camelback Road, Suite 850 | Phoenix, AZ 85016 | www.gilbaneco.com
O: 602.553.4732 | C: 480.381.6308 | F: 602-553-4702
www.gilbaneco.com | Like us on Facebook | Follow us on Twitter